

Name \_\_\_\_\_  
Date \_\_\_\_\_

Teacher \_\_\_\_\_  
Section \_\_\_\_\_

## Geometry Unit 12: Exploring Polygons 2009-2010

Instructions: Select the best response for each multiple choice item. For those items that are not multiple choice, show all work and/or justify your results.



1.

The table below illustrates a relationship between the number of sides in any given polygon and the sum of the angle measures of that polygon.

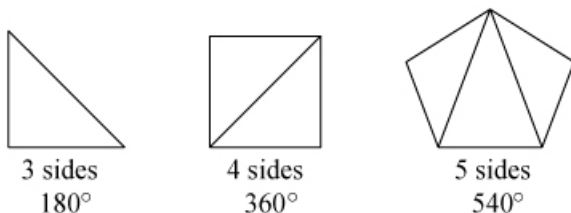
Number of Sides	Sum of Angle Measures
3	180
4	360
5	540
6	720
$n$	

Which of the following best expresses this relationship?

- A.  $60n$
- B.  $180n$
- C.  $180(n - 2)$
- D.  $90n$

2.

The number of sides and the sum of the interior angles are given for each of the polygons shown below.

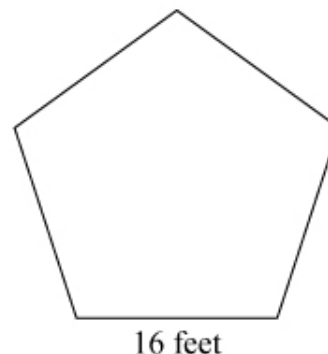


If the pattern continues, what would be the sum of the interior angles of a polygon with 10 sides?

- A. 1000
- B. 1080
- C. 1440
- D. 1800

3.

Which best represents the approximate area of the regular pentagon below?



- A. 220 square feet
- B. 440 square feet
- C. 880 square feet
- D. 1660 square feet

4.

Write a rule that expresses the relationship between the number of sides of a regular polygon and the measure of each central angle using the table below.

Measure of each Central Angle	Number of Sides
120	3
90	4
72	5
60	6
	$n$

- A.  $(n - 2)180$
- B.  $360n$
- C.  $180n$
- D.  $\frac{360}{n}$

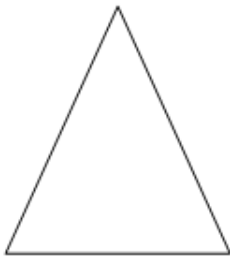
5.

Which of the following polygons is NOT convex? Justify your answer.

A.



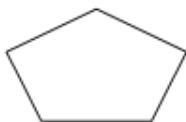
B.



C.



D.



6.

The table below shows the number of diagonals that can be drawn in the listed convex polygons.

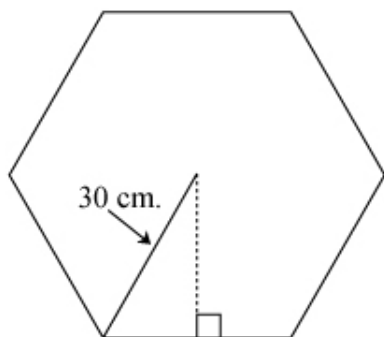
Polygon	Number of Sides $n$	Number of diagonals $d$
Triangle	3	0
Quadrilateral	4	2
Pentagon	5	5
Hexagon	6	9
Heptagon	7	14

A. How many diagonals could be drawn for a 20 sided figure?

B. How many sides would a polygon have if it has 54 diagonals?

7.

A regular hexagonal stained glass window is being constructed above the entry door in the new bank. A diagram of the window is below.

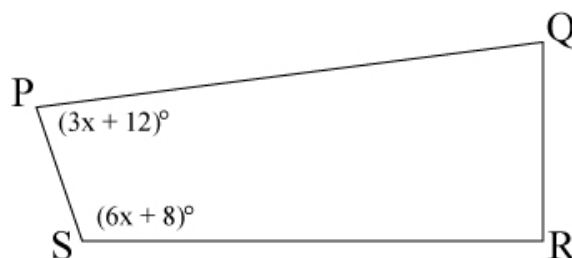


A. How many feet of edging will be needed to frame the window? Round answers to the nearest tenth.

B. What is the area covered by the window in square feet? Round answers to the nearest tenth.

8.

The diagram below shows Quadrilateral PQRS.



If the measure of angle Q is 70 degrees and the measure of angle R is 90 degrees, complete the following:

a. What is the measure in degrees of the entire quadrilateral?

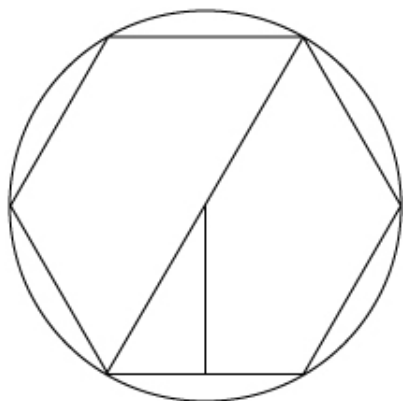
b. What is the measure of angle S?

9.

Is it possible to have a polygon with an interior angle sum of 2450 degrees? Why or why not? Justify your answer.

**10.**

A regular hexagon is inscribed in a circle with a diameter of 4 units.

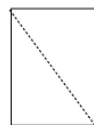


A. What is the relationship between the perimeter of the hexagon and the circumference of the circle?

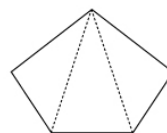
B. If an apothem is constructed to intersect the diameter, which type of triangle is formed?

**11.**

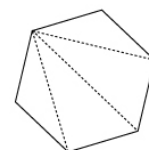
Each convex polygon below has been divided by drawing all possible diagonals from one vertex.



$$2 \times 180^\circ = 360^\circ$$



$$3 \times 180^\circ = 540^\circ$$



$$4 \times 180^\circ = 720^\circ$$

In a convex octagon, how many diagonals can be drawn from one unique vertex?

B. How can this information be used to find the sum of the measures of the interior angles of the octagon?

C. Which algebraic expression can be used to find the sum of the measures of the interior angles of a convex polygon?

D. What is the sum of the measures of the interior angles of a convex octagon?

**12.**

The measure of the interior angles of selected regular polygons is shown in the table below.

Polygon	Measure of the Interior Angles (in degrees)
Triangle	60
Quadrilateral	90
Pentagon	108
Hexagon	?

What is the measure of the interior angles of a regular hexagon? Justify your answer.

**13.**

The sum of the exterior angles of any given polygon is always equal to —

**14.**

Determine which of these figures are polygons. If it is not a polygon, give a justification.

A.



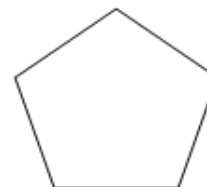
B.



C.



D.

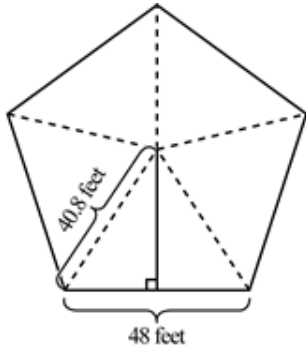


**15.**

The angle sum formula for polygons states that the sum of the measures of the interior angles of a convex polygon is equal to  $180(n - 2)$ , where  $n$  is the number of sides in the polygon. Explain whether this formula would hold true for concave polygons. Use examples, if needed, to help justify your answer.

16.

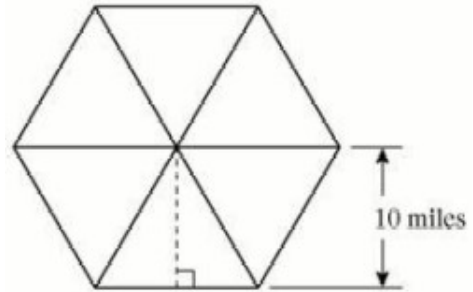
Esther's company has been contracted to lay carpet in a room at a new observatory. The floor plan for the room is in the shape of a regular pentagon and has measurements as shown in the diagram below.



What is the area, in square feet, that Esther's company will carpet?

17.

Rheagan read a science fiction novel about a future city laid out in the shape of six equilateral triangles forming a hexagon. The perpendicular distance from the center of the city to each side of the hexagon is 10 miles as shown below.



A. What is the area of one section of the city?  
Show your work or explain how you found your answer.

B. What is the perimeter around the city?  
Show your work or explain how you found your answer.

**18.**

The table below shows some information about the angles of regular polygons.

**Angle Information for Regular Polygons**

Number of Sides	Sum of the measure of the interior angles	Number of degrees in each interior angle
3	$180^\circ$	$60^\circ$
4	$360^\circ$	$90^\circ$
5	$540^\circ$	$108^\circ$
6	$720^\circ$	$120^\circ$

Based on the data and pattern in the table:

A. What is the sum of the measures of the angles in a regular polygon with 8 sides?

B. What is the number of degrees of each interior angle of a regular polygon with 8 sides?

C. What is the sum of the measures of the angles in a regular polygon with 50 sides?

D. What is the number of degrees of each interior angle of a regular polygon with 50 sides?



**Answer Key**

#	Item ID	Key	TEKS	Stimulus
1	M0G00059RX	C	G.5A	-
2	MG1091910D	C	G.5B	-
3	MG1091939D	B	G.8A	-
4	MG1091951D	D	G.9B	-
5	MG1091961D	A	G.2B	-
6	M0G3232950	See attached Rubric or Checklist	G.5A	-
7	MG1091935D	A. 5.9 feet  B. 2.5 square feet	G.8F	-
8	MG1091921D	a. 360 degrees  b. The measure of angle S is 128 degrees. $(3x + 12) + (6x + 8) + 70 + 90 = 360$ $9x + 20 + 160 = 360$ $9x = 180$ $x = 20$ Substitute $x = 20$ into the expression to get the measure of angle S.	G.5B	-
9	MG1091927D	No, 2450 is not divisible by 180 therefore, the polygon could not have the sum of 2450 for its interior angles. The number of sides would be about 13.6 which is not possible.	G.2B	-
10	MG1091929D	A. The measure of the hexagon's perimeter is always less than the measure of the circle's circumference.  B. The triangle formed is a right triangle, specifically a 30-60-90 triangle.	G.2B	-

#	Item ID	Key	TEKS	Stimulus
11	MG1091937D	<p>A. 5 diagonals can be drawn</p> <p>B. The diagonals divide the octagon into 6 triangles. The sum of the measures of the angles of a triangle is 180 degrees. Multiply 180 times 6 to find the sum of the measures of the interior angles of the octagon.</p> <p>C. <math>S = 180(n-2)</math>, where S is the sum of the angles, and n is the number of sides of the polygon</p> <p>D. 1080 degrees</p>	G.5A	-
12	MG1091943D	120°	G.5B	-
13	MG1091949D	360 degrees	G.9B	-
14	MG1091955D	<p>Figure A is not a polygon because it contains curved lines.</p> <p>Figure B is a polygon.</p> <p>Figure C is not a polygon because it is not a closed figure.</p> <p>Figure D is a polygon.</p>	G.2B	-
15	M0G00069RX	See attached Rubric or Checklist	G.9B	-
16	M0G3068458	<p>Two possible answers.</p> <p>3,958.8 square feet</p> <p>3,960 square feet if rounded</p>	G.8A	-
17	MG1150795D	57.7 to 60.0 square miles and 69.0 to 69.3 miles	G.8A	-
18	M0G3067429	See attached Rubric or Checklist	G.5B	-

**Checklist List**

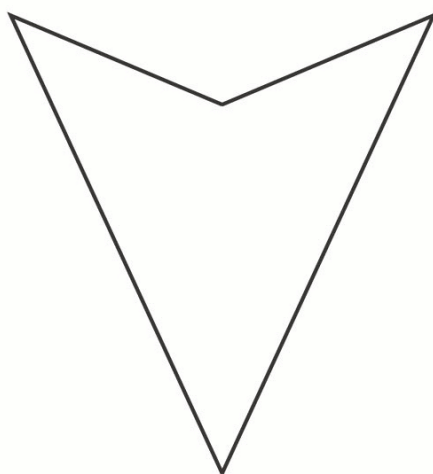
**6)**

A. 170 diagonals

B. 12 sides

**15)**

No, because the angles should be  $180(4 - 2)$  for this quadrilateral or 360 degrees, but for this quadrilateral, the concave point yields an interior angle that is very large, making more than 360 degrees.



**17)**

A correct response for part *a* - 57.7 - 60.0 square miles and part *b* - 69-69.3 miles.

A correct response for either part *a* - 57.7 to 60.0 square miles - OR part *b* - 69 to 69.3 miles.

Response provides irrelevant information or no response. Part of the problem may be copied, but there is no attempt at a solution or the response is illegible.

**18)**

A.  $1080^\circ (180 \times 6)$

B.  $135^\circ (1080 \div 8)$

C.  $8640^\circ (180 \times 48)$

D.  $172.8^\circ (8640 \div 50)$

**Rubric List****9)**

<b>3</b>	The response shows full understanding of the essential mathematics applicable to the task and a sound approach toward solution that includes logical reasoning and appropriate conclusions. Computation and procedures used are generally accurate, but the response may contain minor computational or procedural flaws that do not detract from evidence of full understanding.
<b>2</b>	The response shows a satisfactory understanding of the essential mathematics applicable to the task, but reasoning may not be completely clear, and there may be minor flaws in computation and/or use of procedures as a result of carelessness or non-essential misunderstandings. The flaws do not detract from evidence of satisfactory understanding. A score of 2 may also be earned if the response is partially correct but some aspect of the task is omitted.
<b>1</b>	The response indicates limited understanding of the essential mathematics applicable to the task. While an effort is made to address the task, omissions and/or errors related to insufficient mathematical knowledge or incorrect application of skills or procedures bring into question that student's ability to deal successfully with tasks of this type.
<b>0</b>	The response indicates no understanding of the essential mathematics applicable to the task, or there is no response.

12)

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14)

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15)

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